IN THE SPECIFICATION:

Please replace the paragraph appearing from page 3, line 22 to page 4, line 21, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

If an attempt is made by a bicycle rider to climb a slope using the same speed increasing ratio as that used when the rider is running on flat land, a □larger force is necessary, and whether or not the rider can continue riding the bicycle is determined by the strength of the legs of the rider. To the rider, a speed changing mechanism is an apparatus for trading the speed of applying force for the applied force, or an apparatus for optimizing the balance between speed of applying force and the applied force. In other words, if the muscular force becomes insufficient upon uphill riding, the speed changing mechanism is down-shifted to reduce the speed increasing ratio, allowing the muscles to move at a higher speed with a smaller amount of force, and yet producing the same amount of power. However, reducing the speed increasing ratio below a certain level is meaningless. That is, as the speed increasing ratio is reduced in order to keep the bicycle running, the rider must pedal faster to rotate the driving axle faster in reverse proportion to the decrease in the speed increasing ratio, which in turn causes the rider to reach his or her limit in physical capacity, and also increases the friction and/or vibrations for which the bearings and chain of the driving mechanism are responsible. Eventually, it becomes impossible for the rider to keep the bicycle balanced to continue riding.

Please replace the paragraph appearing from page 4, line 22 to page 5, line 19, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--The provision of a speed changing mechanism does not guaranty increase in the power input. Thus, it is obvious that there is a limit in the improvement in slope climbing performance. Therefore, a means for increasing the power input by a rider has been desired. Here, the power input by a rider means the amount of the power (amount of work per unit of time) transmitted from the rider of a bicycle, that is, a human-powered vehicle, to the bicycle through the driving mechanism of the bicycle. In a speed changing mechanism, the revolution of its output shaft is in inverse proportion to the amount of the torque output through the output shaft, the product of the two (revolution of the output shaft and the amount of the torque output through the output shaft) remains constant. In other words, a speed changing mechanism allows the speed increasing ratio, that is, the balance point between the muscular speed and force, to be changed in accordance with the physical capacity of a rider and the riding conditions, in the direction to allow the rider to feel more comfortable. In principle, however, a speed changing mechanism does not change the overall amount of the power input by a rider, and therefore, the overall amount of the power output through the output shaft does not change.--

Please replace the paragraph appearing at page 8, lines 10-26, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--As an invention similar to the aforementioned human-powered vehicle driving mechanism, in which the crank length are rendered variable, there is U.S. Patent No. 4,872,695. According to this patent, the driving mechanism comprises a rear wheel fork, a pair of bearings, a pair of connecting rods, a pair of cranks, and a pair of pedals. The bearing is pivotally attached to the rear wheel fork, and one end of the connecting rod is slidably fitted in the bearing. The end portion of the crank is rotationally connected to the connecting rod, at a point slightly toward the end portion with respect to the center, and the pedal is attached to this end portion of the rod. Thus, as a rider steps on the pedal, the connecting rod acts as a lever having the bearing as its fulcrum, amplifying the applied force from the rider as it is transmitted to the crank.--

Please replace the paragraph appearing from page 9, line 20 to page 10, line 10, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--Figure 13 is a graph created by modifying Figure 7.3 in High-Tech Cycling (Human Kinetics, P.O. Box 5076, Campaign, IL, USA) in order to effectively describe the present invention, and shows the relationship between the rotational force (the tangential component of the force acting on a pedal) and crank angle. The change of the rotational force while an American bicycle racer was pedaling with a power of 350 W (which appears to represent the amount of work effected upon the crank per unit of time, although no clear definition is given in the above document), at 90 rpm, is plotted on the axis of ordinates, and the crank angle θ

(clockwise angle with reference to the top dead center) is plotted on the axis of abscissas. According to this graph, the rotational force is highest when the crank angle θ is slightly greater than 90°, and begin to rapidly reduce as the crank angle θ is beyond approximately 120°.

Please replace the paragraph appearing from page 11, line 9 to page 12, line 12, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--The human-powered vehicle driving mechanism disclosed in Japanese Laid-Open Patent Applications 58-133986, 58-221783, and 8-113180 comprise a pair of, that is, left and right drive trains, driving sub-mechanisms made up of a combination of a rope and pulleys, a combination of reciprocable chain and sprockets, and a rack and a pinion gear, correspondingly. In these driving mechanisms, the left and right drive trains are mechanically connected to each other in such a manner that when one side is in the forward stroke, the other side is in the backward stroke (incidentally, the names used for the above described driving mechanism components were arbitrarily chosen by the inventors of the present invention for convenience in describing the components, and they do not necessarily match the names used in the original specifications). For example, as the pedal of the left drive train is stepped in its forward stroke, the applied force is transmitted to the pulley, sprocket, and pinion gear through the rope, chain, and rack, correspondingly, and therefore, the wheels connected to the pulley, sprocket, and the pinion, correspondingly, rotate. When the left drive train is in the backward

stroke, the pedal of the left drive train is lifted by the power from the right drive train. Also during this period, the pulley, sprocket, or pinion gear in the left drive train is allowed to idle relative to the output shaft, by a free wheeling mechanism, such as a rachet or one-way clutch, with which their shaft portions are provided.--

Please replace the paragraph appearing at page 13, lines 1-19, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--Japanese Laid-Open Patent Application 58-199279 discloses an invention, according to which the driving mechanism is rendered reciprocal with the employment of a combination of a chain and a sprocket, and a spring is made to absorb a part of the energy transmitted as a rider steps on a pedal, so that the pedal is returned to the pre-stepping (original) pedal position, by the energy stored in the spring. However, this invention also has a problem in that unless the pedaling motion is not synchronized with the free spring movement, increase in the output cannot be expected (if the pedal is stepped on before it fully returns, a sufficient distance is not available for pedal acceleration to have positive work even in the case of this invention, the initial pedal speed, or the pedal speed at the very moment the pedal begins to be stepped on, is considered to be 0 m/s), and therefore, a significant amount of increase in bicycle speed cannot be expected.--

Please replace the paragraph appearing at page 15, lines 14-19, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--The fourth invention provides a human powered drive mechanism according to the first invention, further comprising constraining means for constraining rotation of said drive receiving portion about a line included in a plane in which the endless driving member moves.--

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Please replace the paragraph appearing at page 15, lines 20-24, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--The fifth invention provides a human powered drive mechanism according to the first invention, wherein said drive receiving portion is rotatable about an axis substantially perpendicular to a plane in which said endless driving member moves.--

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Please replace the paragraph appearing from page 16, line 15 to page 17, line 2, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--The seventh invention provides a human powered drive mechanism according to the first invention, wherein said constraining means includes an arm having one end rotatably mounted to said drive receiving portion and a free crank having one end rotatably mounted to a frame and the other end rotatably mounted to the other end of the arm. The eighth invention provides a human powered drive mechanism for a human powered vehicle comprising a propulsion wheel, a rotatable member, a supporting member an endless driving member extended around said rotatable member and said supporting member, and a human powered drive

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receiving portion mounted to said endless driving member, wherein said propulsion wheel is connected with said rotatable member.--

Please replace the paragraph appearing from page 18, line 24 to page 19, line 2, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--The sixteenth invention provides a human powered drive mechanism according to the thirteenth invention, wherein said driving force receiving link is rotatably mounted to said constraining means by a roller bearing or a linear motion bearing such as a linear bush or the like.--

Please replace the paragraph appearing at page 21, lines 1-7, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--In such a case, even if a force is imparted to the pedal or the handle, the chain is not bent or twisted, and therefore, the chain is protected from deformation or damage. Additionally, the position of the force acting point is determined so that application of force is easy with less muscle and joint fatigue.--

Please replace the paragraph appearing at page 21, lines 8-23, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

--In that case, it is preferable that the constraining means comprises a free crank rotatably mounted to the frame at an end thereof and an arm rotatably

mounted to the other end of the free crank, and the arm is rotatably mounted to the drive receiving portion. Since the arm is rotatably mounted to the drive receiving portion, the rotation of the arm does not obstruct the motion of the chain, or the chain does not receive abnormal force. The advantage of the constraining means of this type is in that use can be made, for support and connection for the free crank and/or the arm, with a ball bearing, cylindrical roller bearing or needle bearing with which the frictional loss is very small and which is light in weight and small in size and with which the dust sealing is easy.

Please replace the paragraph appearing from page 24, line 19 to page 25, line 14, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

In another example of the position of the center of rotation of the free crank, the center of rotation of the free crank is disposed outside the oval orbit formed by the chain. In this case, when the radius of the pitch circle of the rotatable member and the radius of curvature of the supporting member (the radius of a pitch circle if the supporting member is in the form of a rotatable member), which constitute the pair, are the same, the rotational axis of the free crank is disposed on a line perpendicularly bisecting the line connecting the centers of the rotatable member and the supporting member. By doing so, the sum of the radius of rotation of the free crank and the radius of rotation of the arm can be made small, so that bending and torsion of the free crank and the arm are small, and therefore, the weight saving is accomplished. By selecting a length of the free crank such that a swing range of

the free crank does not overlap the moving range of the endless driving member, the free crank can be disposed closer to the center line of the bicycle or the like than the arm, thus accomplishing compact human powered drive mechanism.

Please replace the paragraph appearing from page 37, line 27 to page 39, line 4, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

Figure 1 shows a general arrangement of the human powered drive mechanism according to the first embodiment of the present invention which is applied to a bicycle. Left and right human powered drive units are disposed parallel to each other. A line connecting the centers of a rotatable member and a rotatable supporting member extends vertically. Referring to Figure 1, a human powered drive unit at a front side of the sheet of the drawing, that is, the right side unit of the rider is called "right-hand unit" (also referred to as a "first human powered drive unit"), and the other is called "left-hand unit" (also referred to as a "second human powered drive unit"), the parts of the right-hand unit are assigned with double-digit reference numerals, and the parts of the left-hand unit are assigned with the like numerals with "00" added. Left and right machine elements which need not be discriminated, such as bearings, nuts and the like are given the same reference numerals. Figures 2 to 9 illustrate the human powered drive mechanism of this embodiment, and Figure 2 is a side view of the whole bicycle; Figure 3 is a view taken along a line Y-Y of Figure 2; Figure 4 is a view taken along a line X-X of Figure 2; Figure 5 is a view taken along a line A-A of Figure 3; Figure 6 is a view

taken along a line B-B of Figure 3; Figure 7 is a sectional view taken along a line C-C of Figure 3; Figure 8 is a view taken along a line D-D; Figure 9 is a sectional □view taken along a line E-E; and Figure 10 illustrates a modified example of the mechanism shown in Figure 3. The following description will be made with respect to the right-hand unit, and the description with respect to the left-hand unit is omitted for the sake of simplicity, except for the necessary parts.

Please replace the paragraph appearing from page 39, line 5 to page 40, line 8, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

In Figures 1 to 9, designated by reference numerals 1 and 2 are a first rotatable member (sprocket) and a first supporting member (sprocket) which are rotatably mounted to a circular cylinder 32 which is extended in the vertical direction, respectively; 100 and 200 are a second rotatable member (sprocket) and a second supporting member (sprocket), respectively; 3 and 300 are chains (endless driving members) trained on or extended around the second rotatable member 100 and second supporting member 200 and forming oval orbits; 4 and the 400 are pedals for driving the chains through driving force receiving links 12, 1200 and pedal shafts 17, 1700, respectively. The pedal 4 (first human powered drive receiving portion), 400 (second human powered drive receiving portion) are mounted at positions with phase deviation by 1/2 period. Designated by 10, 1000 and 11, 1100 are free cranks and arms which function to maintain perpendicularity

between the pedal shafts 17, 1700 and the movement planes of the chains, respectively. Designated by 6 are a chain ring (third rotatable member) which is fixed on a driving shaft 15 together with the first rotatable member 1 and second rotatable member by a nut 26 and spacers 24, 25; and 7 is a driven sprocket of a rear wheel driven by the chain ring 6 through a transmission chain 8. In Figure 7, the driving shaft 15 is rotatably supported by a boss 34 penetrated through and fixed on the circular cylinder 32 through a bearing 27. The circular cylinder 32 is welded to a connecting part of a down tube 30 and a seat tube 31 of the frame of the bicycle.

Please replace the paragraph appearing from page 44, line 23 to page 45, line 2, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

As contrasted to the above described human powered drive mechanism of reciprocable linear motion type, at the initial stage of the kick in the power phase, the moving speed of the pedal is still high, there is no need of an acceleration distance, and therefore, in all the power phase the human power is converted to the torque.

Please replace the paragraph appearing from page 49, line 18 to page 50, line 6, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

When the third embodiment is applied to a bicycle, the power input is approx 1.18 times that of a conventional bicycle, on the assumptions that crank radius of the conventional bicycle is R; that average moving speeds of the pedals of the conventional bicycle and the bicycle of this example are the same; that in the linear range of the endless driving member at the power phase, the rotational force is kept at the same value as that at a crank angle of 90° given in Figure 13; that in the linear range of the endless driving member at the recovery phase, the rotational force is kept at the same value as that at a crank angle of 270° given in Figure 13; in the circular range of the endless driving member, the rotational force is equal to that of the corresponding crank angle given in Figure 13.

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Please replace the paragraph appearing from page 50, line 7 to page 51, line 1, with the following replacement paragraph. A marked-up version of the original paragraph, showing the changes made thereto, is attached.

In the physical meaning, the work is the product of the force acting on a point and the displacement of the point in the direction of the force, and therefore, if the displacement is zero, the work is zero no matter how large the force is. On the other hand, in order for a human body to apply a force, it is necessary to contract the muscle, and production of a force requires energy consumption. It is assumed that produced force integrated with time is substantially proportional to the energy consumed to keep the force. Then, the produced force is substantially proportional to the power (work rate) consumed by him or her. It is assumed that one foot of the

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